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Dogadkin formulated a theory of emulsion polymerization, establishing relationships which permit one to determine the quality of the resulting rubber. In 1941, he received the Stalin Prize for work in this field.

Dogadkin clarified the role which molecular oxygen plays in structural changes of rubber, particularly in the course of the vulcanization process. As far as vulcanization of synthetic rubbers is concerned, he carried out investigations in the field of kinetics, advanced a theory explaining occurrence of an optimum, and brought out peculiarities which occur in the vulcanization of synthetic rubbers. Upon clarifying the structural differences between the soluble and insoluble fractions of rubbers, Dogadkin demonstrated the possibility of transferring insoluble rubbers and vulcanized products into the soluble state by treatment with molecular oxygen. He also developed catalysts for the solubilizing oxygen reaction. The process of destructive solution of vulcanized products which was discovered by Dogadkin has been applied in developing efficient procedures for the recovery of rubber. A thorough investigation of the role played by oxygen in plastification, recovery, and the aging of rubbers has led to a clarification of many questions connected with these industrial processes, particularly as far as synthetic rubbers are concerned.

Dogadkin gave a correct picture of the state of rubber in solution after investigating the problem of this state by the method of surface tension measurements at the solution-water boundary. He also was the first to develop and apply a light scattering method for the determination of the molecular weight of rubber. Furthermore, he investigated and clarified the mechanism of structural modification of dissolved rubber under the action of light.

Dogadkin initiated in the USSR investigations of the structure of the typical and most widely used grades of rubber containing carbon black. For these investigations, the electron microscopic method was used and entirely new methods were developed which combine a study of the kinetics of swelling of the rubber in question with measurements of electrical conductivity and dielectric properties. On the basis of these investigations, the dependence of mechanical properties and resistance to use on the type of distribution of the filler was established and conditions bringing about the formation of various structures were defined.

Lately Dogadkin and his students have worked successfully on the kinetics of elastic deformations of crude and vulcanized rubber. One of the results of this work consisted in the introduction of a significant correction into Maxwell's equation by establishing that there is a square power relationship between tension and the constant of relaxation. In the course of this work, the effect of swelling in various softeners on relaxation and fatigue strength of rubber was studied.

In the field of technology, Dogadkin's work has solved practical problems in connection with the production of synthetic latex, production of special grades of hard rubber, recovery of rubber, manufacture of rubber products from latex, etc.

Dogadkin created a Soviet school of investigators in the field of physics and chemistry of rubber. Among his pupils and collaborators, there are four doctors and 16 candidates of sciences. During 1936 - 1938, Dogadkin was chairman of the Bureau of the Scientific-Technical Rubber Society. At present, he is member of the Central Council of the Mendeleev Society, chairman of the Society's Colloids Section, and member of the Bureau of the Section of High Molecular Compounds of the society. Since 1945, Dogadkin has been associate editor of Kolloidnyy Zhurnal published by the Academy of Sciences USSR.

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